

RUG Refinement Model

A. Aims and Background

The aim of the “RUG Refinement” is to improve the ability of the existing RUG-III classification system to explain non-therapy ancillary (NTA) costs. We re-examined prior efforts by Abt Associates (2000) and Fries (2003) using data from our 2001 analysis files and extended the research by testing additional variables on the characteristics of SNF patients and exploring consolidation of RUG-III groups. Under this approach, the existing RUG-III classification system continues to be used to account for variations in case-mix related costs of nursing and rehabilitation therapy services, while potential modifications to the RUG-III system are examined to account for variations in the costs of NTA services.

Research by Abt Associates identified a number of different strategies to improve the ability of the RUG-III system to explain NTA costs (Abt 1999, Abt 2000). First, Abt Associates discovered that individuals who qualified for both the “Rehabilitation Therapy” and “Extensive Services” sets of categories in RUG-III had NTA costs that were much higher than average. This finding led to the recommendation by Abt Associates to add 14 categories to the RUG-III to represent the intersection of these two RUG-III categories. This new classification scheme is referred to as RUG-58.

In exploratory analyses with 1999 SNF cost and MDS data, we found that the RUG-58 explained about 6% of the variation in log NTA costs, slightly lower than those found on levels of NTA costs by Abt Associates (2000) in its original research. A full comparison of our recent findings and those of prior research on the RUG-58 are presented in materials that we prepared for a technical advisory panel (TAP) meeting in May, 2003 (Fries 2003).

This chapter presents our recent findings on “RUG Refinement” research using the 2001 analysis file. We re-examine the RUG-58 as constructed by Abt Associates.

B. Data and Methods

The primary data sources for our analysis are the 10% SNF stay file and the 10% SNF facility stay file, although we also used a 1% SNF stay file to explore systematically variables that were correlated with total NTA costs. Because of the large number of stays, even in the 1% sample, many of the variables in the SNF stay file were significantly associated with NTA costs. We selected particular variables for exploration when the value of their t-statistic was notably higher than those of other variables. For groups of variables (e.g., diagnosis) and continuous measures we examined the R-square statistics from a regression including only those variables.

Construction of the RUG-58 followed the procedures developed by Abt Associates (2000).

In our exploratory analysis, we examined a wide range of patient characteristics. We evaluated alternative models using the R-squared statistic, which indicates the share of variation in the dependent variable that is explained by the model. The possible values for the R-square statistic range from 0 to 1.0, and an R-square of 0.2, for example, implies that the model explains 20% of the variation in the dependent variable (e.g., NTA costs). We also indicate the share of cases with costs above the 90th percentile that are predicted to have costs above the 90th percentile and the standard deviation of relative weights.

C. Findings

We compared the extent to which the RUG-III and RUG-58 models explain variation in NTA costs.

Descriptive statistics on NTA costs

We examined RUG-related categories (RUG-III and RUG-58) and their relationship to NTA costs. Our general finding was that only two of the individual categories in either RUG-III or RUG-58 independently explain over one percent of variance in NTA costs are (“Extensive Services”, Levels 2 and 3).¹ This finding is consistent with prior research indicating that RUG-III as a whole, for example, explained only about 5% of the variation in NTA costs.

¹ In addition, the RUG-58 rehabilitation therapy category, RVB, has an independent r-squared of exactly 1 percent.

Highlighting variance explanation of different models

A fundamental objective of case-mix classification systems is to explain variation in resource use, so as to appropriately reimburse providers. We examined a number of different models for improving RUG-III to better explain variation in total NTA costs. We highlight the amount of NTA cost variance explained in Table 1. The table presents models using levels of costs for these comparisons. In general, the levels produced higher shares (about 3 percentage points) of variance explained than the logged models of NTA costs, but the relative effectiveness of the models were about the same, regardless of whether NTA costs were logged or not.² Similarly, when we analyzed charges rather than costs, the amount of variance explained was typically somewhat higher, but the relative effectiveness of the models was about the same.

² This difference in R-square between linear and log models disappears if the estimates for the log model are transformed to levels and then the R-square is calculated.

Table 1: Comparison of predictive models incorporating RUG-III and RUG-58 using 2001 DATAPRO 10% Stay file

| Explanatory Variables | R-square | % Predicted ≥90th percentile given actual ≥90th percentile | Standard Deviation of Relative Weights |
|------------------------------|-----------------|---|---|
| RUG-III | 0.064 | 0.314 | 0.354 |
| RUG-58 | 0.095 | 0.376 | 0.429 |
| N=163,386 | | | |

As the point of reference, the basic RUG-III model explains only 6% of the variance in costs. By interacting the “Rehabilitation Therapy” and “Extensive Services” categories to create the RUG-58, NTA cost variance explanation increases to 9.5%. Generally, these models show only a moderate ability predict the high cost cases: At best, 37 percent of cases with costs in the top 10 percent are predicted to have high costs. These results essentially represent a re-examination of prior research to refine the RUG classification system for NTA costs.

The basic RUG-58 model explains around 9% of the variance in NTA costs, a large improvement over the RUG-44 currently in effect for the SNF PPS.